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(54) Catamenial tampon

(57) A catamenial tampon comprises a web 29 of continuous cellulosic filaments having a sinuous overlapping configuration. The web may be constituted by a spun-laid web of cellulosic material produced by depositing a tow of filaments with overfeed on a moving surface.

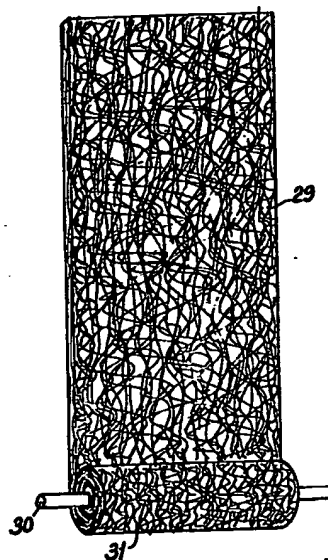


FIG.1

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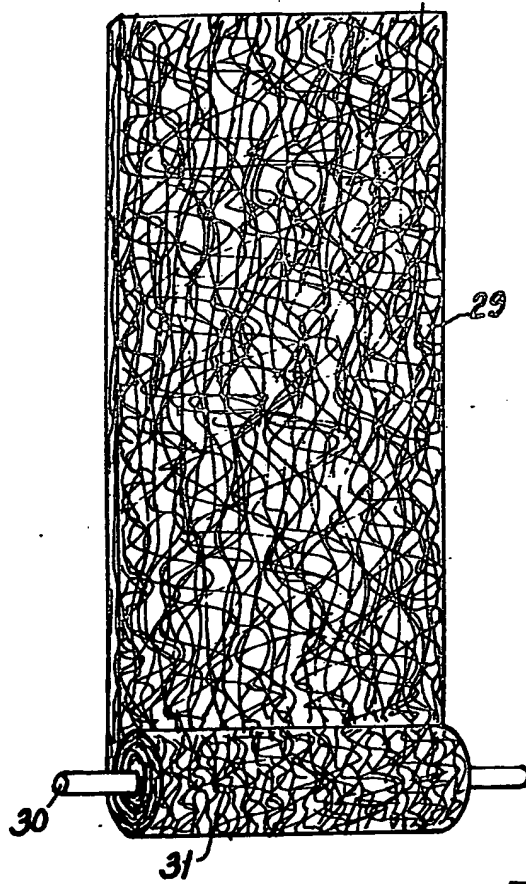


FIG. 1

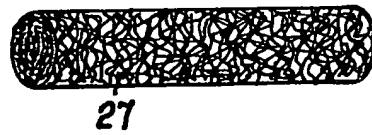
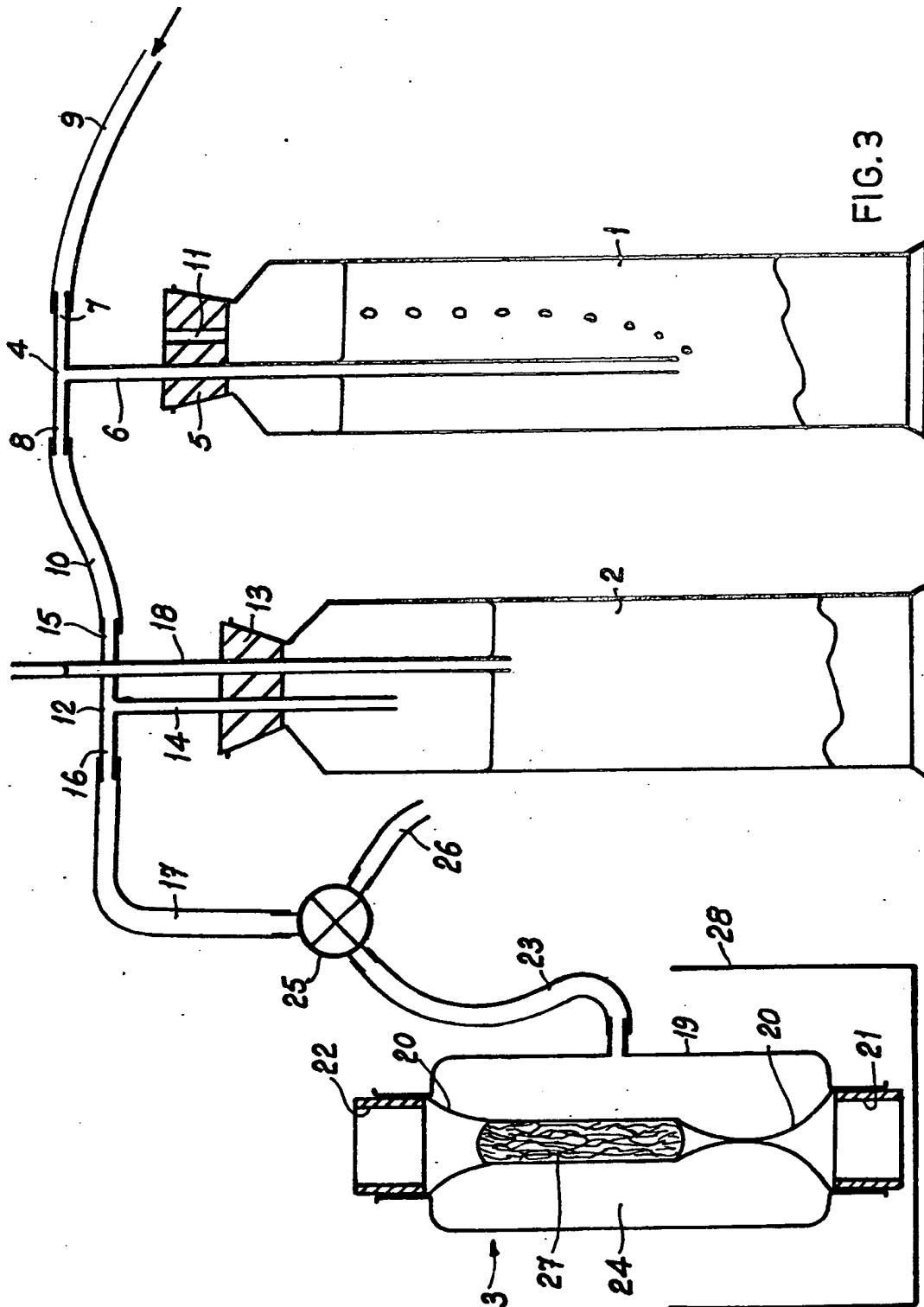


FIG. 2



SPECIFICATION

Catamenial tampon

5 This invention relates to a catamenial tampon.

A catamenial tampon according to the invention comprises a web of continuous cellulosic filaments having a sinuous overlapping configuration.

Advantageously, the continuous filaments may be
10 filaments with a hollow cross-section or a collapsed hollow cross-section or other continuous filaments physically modified so that they have a percentage water imbibition value greater than 110 or preferably

greater than 150. It is particularly advantageous to
15 use filaments having a collapsed multi-limbed cross-section, for example filaments such as those described in British Patent Specifications Nos. 1,333,047 and 1,393,778.

To determine the water imbibition value of fila-
20 ments, a 1 g sample of the dried filaments is soaked in water at a temperature of 20°C for 15 minutes, centrifuged at a force of 1000 g (10,000 N) for 5 minutes, weighed, dried at a temperature of 110°C for 2.5 hours and finally re-weighed. The percentage
25 water imbibition is then defined as follows:

$$\frac{\text{weight of wet filaments} - \text{weight of dry filaments}}{\text{weight of dry filaments}} \times 100$$

In order to achieve a high percentage water imbibition value without modifying the cross-section of the filaments, modifications in spin bath composition and in stretching procedures may be used to

30 produce voids in the filaments.

Preferably, for digitally insertable tampons, the tampon has a stability against longitudinally applied buckling forces of at least 2.5 daN and advantageously the absorbency of the tampon as measured by
35 the modified "Syngyna" test as hereinafter described is at least 3.5 g salt solution/g, preferably at least 5 g salt solution/g.

The web, which has a degree of coherence by virtue of the sinuous overlapping configuration of its
40 filaments, may be constituted by a spun-laid web of cellulosic material produced by depositing a tow of filaments with overfeed on a moving surface, preferably after subjecting the tow to the action of a fluid to promote filament separation.

45 The tampon may be in any construction, preferably a construction which will result in the desired longitudinal stability which enables the tampon to be inserted digitally without the aid of an applicator. Loose assemblages of filaments without inherent
50 coherence will not satisfy the stability requirement set out above although they may achieve relatively high absorbencies.

If the tampon comprises continuous filaments having a hollow collapsed multi-limbed cross-section,
55 surprisingly, a greater absorbency is achieved, in the types of construction having relatively high stability, than would be the case if the tampon were made from staple fibre. This is contrary to general experience using solid filaments where normally a tampon
60 made from continuous filaments has a lower absorbency than one made from staple fibre.

There are many advantages in using a web of continuous filaments in a sinuous overlapping configuration as the raw material for a catamenial tampon.
65 For example, no opening or carding of the raw material is required, as is the case with staple fibre. Production costs are thus reduced. There is less linting of the finished product which is of considerable importance in a product like a catamenial tampon. In
70 addition it is possible to make the tampon of unfinished filaments, because the finish often required for the carding process need not be applied. The final product may thus contain no additives and

this is important for a product like a catamenial tampon which comes into contact with delicate body tissues.

75 Tampons according to the invention may be subjected to radial compression in the course of their manufacture, so that in use, when they absorb
80 liquid, they will expand largely in a radial direction.

The invention will now be described in greater detail, by way of example, with reference to the accompanying drawings, in which

85 Figure 1 is a perspective view of a web being rolled up to form a plug.

Figure 2 is a perspective view of a finished tampon, and

90 Figure 3 is a schematic view of apparatus used for measuring the absorbency of a tampon in accordance with the invention.

In making the tampon 27 shown in Figure 2, continuous filaments of regenerated cellulose are formed into a spun laid web 29 whilst the filaments are freshly regenerated and still in the wet state. The
95 web is dried and cut into rectangular strips approximately 5 cm wide and each weighing approximately 3 g. The strips are laid out on a flat surface and then each strip is rolled on a spindle 30 (as shown in Figure 1) to form a plug 31, starting from one end of the
100 strip. The spindle is removed and the plug is compressed radially in a known press or chuck to produce the tampon 27.

The absorbency of the tampon 27 can be measured in the laboratory by means of a test developed from that described by Professor G. W. Raap of
105 Loyola University, Chicago, Illinois, and known as the "Syngyna Absorbency Test". This test, which in this specification is called the "modified Syngyna" test, is carried out using the apparatus shown in Figure 3.

The apparatus shown in Figure 3 comprises two bottles 1, 2 and a tampon receiver generally designated by the numeral 3. A glass T-piece 4 is mounted in a bung 5 in the bottle 1, with the vertical limb 6 of the T-piece entering the bottle and the ends 7, 8 of the horizontal limb connected to tubes 9 and 10, respectively. The bottle 1 is vented to atmosphere via a hole 11 in the bung 5. A glass T-piece 12 is mounted in a bung 13 in the bottle 2, with the vertical limb 14 of the T-piece entering the bottle and the ends 15, 16 of the horizontal limb connected to the

tube 10 and to a tube 17, respectively. A glass tube 18 passes through the bung 13 into the interior of the bottle 2.

The tampon receiver 3 comprises an open-ended cylinder 19 with an internal, tubular membrane 20 having its ends secured to the ends of the cylinder 19 by means of glass sleeves 21 and 22. A tube 23 communicates with the closed space 24 between the cylinder 19 and the membrane 20. A 3-way valve 25 has its three outlets connected, respectively, to the tube 17, the tube 23 and a tube 26 which is open to the atmosphere.

The modified Syngyna test is carried out as follows:—

The apparatus is set up as shown in Figure 3 with water in the bottles 1 and 2 and the height of the T-piece 4 in bottle 1 is adjusted so that it dips 200 mm below the water surface. The tube 18 dips below the water surface in the bottle 2 and the height of water rise in this tube is equal to the air pressure in the apparatus.

The 3-way valve 25 is moved to the position in which the tube 17 is closed and the tubes 23 and 26 are in communication with one another. Air supplied from a compressor (not shown) along the tube 9 is turned on and adjusted to a steady, moderate flow. The water level in the pressure indicator tube 18 should be at 200 mm and should be fairly steady. If it is not, the immersion of the vertical limb 6 of the T-piece 4 in the bottle 1 should be adjusted until the water level in the tube 18 is a steady 200 mm. Excess air vents through the hole 11 in the bung 5.

The tampon receiver 3 is turned on its side and a weighed tampon 27 is inserted into the tubular membrane 20.

The valve 25 is then turned to a position such that the tube 17 is in communication with the tube 23 and the tube 26 is closed off. Air under pressure now reaches the space 24 from the tube 9 via the horizon-

tal limbs of the T-pieces 4 and 12. The air inflates the membrane 20 and causes it to grip the tampon 27, as shown in the drawing. Once a stream of bubbles emerges from the vertical limb 6 of the T-piece 4 in the bottle 1 and a pressure equivalent to a 200 mm water column has been re-established as shown by the water level in the tube 18, the tampon receiver 3 is turned so that its cylinder 19 is disposed vertically. A pressure equivalent to a 200 mm water column is now exerted on the tampon 27.

The tampon should in the position shown within the membrane 20. If the tampon protrudes from the membrane or if the membrane closes on top of it, the cylinder 19 must be turned on its side once more, and the valve 25 turned so that the tubes 23 and 26 are in communication, venting the space 24 to atmosphere, and the tube 17 is closed. The position of the tampon 27 can then be adjusted, after which the valve 25 is re-adjusted to restore the air pressure in the space 24.

A pump (not shown) is used to deliver the test liquid for the tampon at a rate of 6 ml/min. along a tube which extends through a perforated bung (not shown) which is inserted loosely into the top of the cylinder 19 inside the sleeve 22. The test liquid is thus supplied to the top of the tampon and the supply is maintained until liquid leaks from the bottom of the tampon into a container 28 in which the tampon receiver 3 is located.

The perforated bung (not shown) is now removed from inside the sleeve 22 and any test liquid resting on top of the tampon 27 is poured off. Five minutes is allowed to elapse, the cylinder 19 is turned on its side and the valve 25 is turned to bring tubes 23 and 26 into communication, relieving pressure on the membrane 20. The tampon 27 is removed and weighed and its absorbency is calculated from the following formula:

$$\text{Absorbency (g/g)} = \frac{\text{Weight of wet tampon (g)} - \text{Weight of dry tampon (g)}}{\text{Weight of dry tampon (g)}}$$

To test the stability of a tampon against longitudinally applied buckling forces, the cylindrical tampon is placed with one end on a fixed lower jaw of a test machine, the upper movable jaw is brought down to contact the other end of the tampon and is then set to move down at a speed of 5 cm/min. The force exerted by the tampon on the jaws of the test machine is measured continuously, and the point at which this force begins to fall instead of rise is the point at which the tampon buckles. The maximum force achieved is the stability of the tampon. Usually tests on ten tampons of one type give a sufficiently accurate average result.

Samples of tampons manufactured by radially compressing rolled carded webs of staple fibre and rolled non-woven webs of continuous filaments were made from the following materials:

Sample 1

These tampons were conventional tampons made from a web of carded cellulosic fibres of solid circular cross-section.

Sample 2

These tampons were conventional tampons made from a tow of continuous cellulosic filaments of solid circular cross-section.

Sample 3

These tampons were made from a web of carded staple cellulosic fibres of collapsed multi-limbed cross-section.

Sample 4

These tampons were made, in accordance with the invention, from a continuous filament web of solid 2.4 decitex, unfinished cellulosic fibrous elements in a sinuous overlapping configuration.

Sample 5

These tampons were made, in accordance with the invention, from a continuous filament web of hollow cellulosic fibrous elements with a collapsed multi-limbed cross-section in a sinuous overlapping configuration.

The tampons of Samples 1 to 5 were subjected to the above described "modified Syngyna" and stability tests, and gave the results set out in the following

Table:

Table

Sample No.	Tampon absorbency (g/g)	Tampon stability (daN)
1	4.1	3 to 5
2	3.1	1
3	4.7 to 5.5	4 to 6
4	3.8	3.2
5	5.4 to 6.0	4 to 6

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CLAIMS

1. A catamenial tampon comprising a web of continuous cellulosic filaments having a sinuous overlapping configuration.
2. A tampon as claimed in claim 1, wherein the continuous filaments are physically modified so as to have a percentage water imbibition value (as hereinbefore defined) of at least 110.
3. A tampon as claimed in claim 2, wherein the continuous filaments are physically modified so as to have a percentage water imbibition value (as hereinbefore defined) of at least 150.
4. A tampon as claimed in claim 1, 2 or 3, wherein the continuous filaments have a hollow cross-section or a collapsed hollow cross-section.
5. A tampon as claimed in claim 1, 2 or 3, wherein the continuous filaments have a collapsed multi-limbed cross-section.
6. A tampon as claimed in any one of the preceding claims wherein the tampon has a stability against longitudinally applied buckling forces of at least 2.5 daN.
7. A tampon as claimed in any one of the preceding claims wherein the tampon has an absorbency of at least 3.5 g salt solution/g, as measured by the modified "Syngyna" test as hereinbefore described.
8. A tampon as claimed in claim 7, wherein the tampon has an absorbency of at least 5 g salt solution/g as measured by the modified "Syngyna" test as hereinbefore described.
9. A tampon as claimed in any one of the preceding claims, wherein said web is constituted by a spun-laid web of cellulosic material produced by depositing a tow of filaments with overfeed on a moving surface.
10. A tampon as claimed in claim 9, wherein the tow has been subjected to the action of a fluid to promote filament separation before overfeeding on to a moving surface.
11. A catamenial tampon substantially in accordance with the above-described Sample 4 or Sample 5.